(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 002 645 A1

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
24.05.2000 Bulletin 2000/21

(51) Int. Cl.[7]: **B41F 15/40**

(21) Application number: **98830699.9**

(22) Date of filing: **20.11.1998**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(71) Applicant:
Gomes Technology S.p.A.
41042 Fiorano Modenese (MO) (IT)

(72) Inventor: **Mescoli, Giuliano**
41043 Formigine (MO) (IT)

(74) Representative: **Gotra, Stefano**
BUGNION S.p.A.
No. 25, Via Emilia Est
41100 Modena (IT)

(54) **A process and device for realising silk screen prints on objects**

(57) A process and device for silk-screening flat objects, in particular ceramic tiles (2), in which a rotary cylindrical silk screen (3) is made to pass between a doctor (4) and a contrast element (5) made of teflon. Glaze is distributed on the doctor (4), which glaze is forced by action of the doctor (4) and the contrast element (5) to occupy perforations in the silk screen (3). A blower (6), internal of the silk screen (3) and operating on a bottom generatrix thereof, directs a jet of air downwards, so that the glaze contained in the screen perforations is blown by the jet and transferred on to the upper surface of the tiles (2). The invention considerably reduces wear on the silk screen (3).

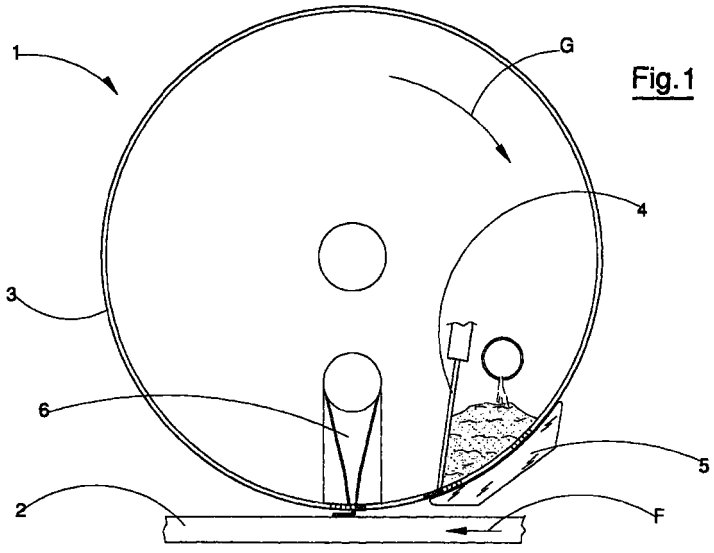


Fig.1

EP 1 002 645 A1

Description

[0001] Specifically, though not exclusively, the invention can be used for making silk screen designs on flat objects, especially ceramic tiles.

[0002] The prior art teaches silk screening processes on ceramic tiles, where the screen is rotary and mounted on a cylinder. In these applications the silk screen is set in rotation about a horizontal axis and made to roll without dragging on underlying tiles transiting along a conveyor line. The screen is constituted by a net-type screen supported on a structure which makes the screen cylindrical.

[0003] The liquid product to be distributed on the tiles, constituted by one or more ceramic glazes, is introduced internally of the screen, where a doctor, operating on the bottom generatrix of the screen, causes the glaze to pass through the spaces in the screen.

[0004] This process exhibits some drawbacks.

[0005] Firstly, contact between the tiles and the silk screen causes rapid screen wear, which means frequent screen substitution.

[0006] Secondly, due to the screen action, the tiles can be subjected to flexion, especially if the screening is done in more than one stage. This can lead to serious risk of damage to the tiles.

[0007] A further drawback is that in order to perform a correct silk screening process, the surface of the tiles must be completely smooth and flat; as a consequence traditional silk screening is not suited to tiles having a corrugated top surface, or a surface featuring reliefs.

[0008] The main aim of the present invention is to obviate the above-mentioned drawbacks by provided a silk-screening process which considerably reduces wear on the silk screen.

[0009] An advantage of the invention is that it eliminates risks of damage to the objects undergoing silk screening due to the action of the screen and the doctor on the objects themselves.

[0010] A further advantage is that corrugated or otherwise non-flat surfaces can be silk-screened using the process.

[0011] A further aim of the invention is to provide a device, constructionally simple and economical, which can be used to realise the process of the invention.

[0012] These aims and advantages and others besides are all attained by the present invention, as it is characterised in the appended claims.

[0013] Further characteristics and advantages of the invention will better emerge from the detailed description that follows of some preferred but non-exclusive embodiments thereof, illustrated purely by way of non-limiting example in the accompanying figures of the drawings, in which:

figure 1 schematically shows a side view in vertical elevation of a first embodiment of the device of the invention;

figure 2 schematically shows a side view in vertical elevation of a second embodiment of the invention;

figure 3 schematically shows a side view in vertical elevation of a third embodiment of the invention.

[0014] With reference to figure 1, 1 denotes in its entirety a device for silk-screening objects, advantageously utilsable in particular for silk-screening flat objects, such as ceramic tiles 2.

[0015] The silk-screening device 1 is predisposed above a transport line along which the tiles 2 can advance in ordered succession in an advancement direction indicated by arrow F.

[0016] The silk-screening device 1 comprises a silk screen 3, the screen itself being made of a net material having perforations through which a glaze to be applied on an upper surface of the underlying tiles can pass.

[0017] In the embodiment of figure 1, the screen 3 is cylindrical with an axis extending transversally of the tile advancement direction F. The screen 3 can be set in rotation about the axis, in coordination with the tile advancement motion, by means of a motor which is of known type and not illustrated.

[0018] The lower tract of the screen 3, constituted in the example by its bottom generatrix, is mobile in a parallel direction to tile advancement direction F, and is located at a short distance from, but not touching, the underlying upper surface of the tiles 2 transiting along the transport line, without interacting with the tile surfaces.

[0019] Means are provided on the screen 3 in a zone upstream of the bottom generatrix of the screen (by upstream we mean in reference to the rotation direction of the screen 3), which means are for filling the perforations in the screen with glaze. The means for filling comprise a fixed doctor 4 predisposed to operate on the internal surface of the screen 3; set in opposition to the screen 3, on the outside of the cylinder, is a rigid contrast element 5 having a constrasting surface which can operate in contact with the outside surface of the screen 3. During operation the screen 3 is made to rotate contactingly between the doctor 4 and the contrast element 5, and exhibits a curvature which corresponds to the curvature of the screen drum. The contrast surface is preferably made of a low-friction material, such as teflon.

[0020] The device 1 is also provided with known-type means (not illustrated) for distributing the glaze internally of the screen 3 in the zone comprised between the doctor 4 and the internal surface of the screen 3.

[0021] Blowing means are positioned above the bottom generatrix of the screen 3, which means direct a jet of air downwards so as to strike the upper surface of the underlying and transiting tiles 2, through the perforations in the silk screen 3. The blower 6 is constituted by a pneumatic convector provided with a jet for expelling air downwards, which jet is elongate and narrow so as

to interest the whole of the bottom generatrix of the screen drum. Thus the jet of air is concentrated on the generatrix, i.e. a narrow and long zone of the mobile bottom tract of the screen 3 and parallel to the longitudinal axis of the screen 3.

[0022] During operation, the tiles 2 are fed in succession along the transport line, while the screen 3 is set in rotation in the direction denoted by arrow G, so that the drum's peripheral speed coincides with that of the advancement of the tiles.

[0023] The glaze is distributed on the doctor 4 which, cooperating with the surface of the contrast element 5 contrasting it, squeezes the glaze into the perforations in the screen 3. The doctor 4 operates so as to scrape the excess glaze and to clean the full zones of the screen, leaving them substantially free of glaze.

[0024] When the screen is rotated and the glaze contained in the empty perforations in the screen 3 passes under the blower 6, the jet of air issued drags the glaze with it and deposits it on the underlying and transiting tiles 2. The whole process, it is stressed, is continuous.

[0025] Figure 2 is an illustration of a further embodiment of the invention, where the doctor 4 operates on the external surface of the screen 3, while the active surface of the contrast element 5 operates on the internal surface of the screen 3. The doctor 4 is located in the upper half of the cylindrical screen 3, whereas in figure 1 it was located in the bottom half. The glaze is distributed between the doctor 4 and the external surface of the screen 3. Apart from this, the structural elements and the operation of the screen are substantially the same as in the first embodiment shown in figure 1. In figures 1 and 2 the same contructional elements are denoted with the same numbers.

[0026] In the embodiment of figure 3, the screen, though having like the other embodiments a tubular form with a longitudinal axis arranged transversally to the advancement direction F of the tiles 2, is not cylindrical, but is made of flexible tape ring-wound about wheels 7 so that it can be drawn in movement about the wheels 7 themselves about a longitudinal axis thereof in the direction indicated by arrow D. A brief inferior tract of the screen 3 is maintained in tension by means of two wheels situated side-by-side, in a flat, horizontal and parallel arrangement in relation to the upper surface of the transiting underlying tiles 2. The blower 6 operates at the lower, flat tract of the screen 3. In this case too the filling of the screen matrix with glaze is done by a doctor 4 and a contrast element 5 counterposed thereto. The active surface of the contrast element 5, which imitates the form of the screen 3, is substantially flat and acts at an oblique tract of the screen 3. The doctor 4 operates internally of the screen 3, upstream of the blower 6 where the glaze 6 is distributed to fill the matrix. In this case too the glaze contained in the matrix of the screen is then struck by the air jet issued from the blower 6 and projected on to the upper surface of the tiles 2. The operation of the device of figure is substantially the same as in the other two embodiments.

[0027] In a further embodiment, not illustrated, during the application of the glaze on the tiles, the tiles themselves and the screen, with the matrix loaded with glaze, are immobile while the blower is horizontally mobile on the screen, which in this embodiment can be flat. The loading of the glaze in the screen perforations can be achieved, like in the previous embodiments, by a filler device which is mobile with respect to the screen, comprising a doctor and a counter-doctor, between which the screen is made to pass before being positioned on the waiting tile.

[0028] In all of the above-described embodiments, the screen is never in contact with the upper surface of the tiles. The transfer of the glaze on to the tile is done by means of an air jet which passes through the matrix of the screen and transfers the glaze from the matrix on to the underlying tiles. The screen is subject only to a contact drag with the doctor contrast element, which can be made of an anti-friction material, with a subsequent considerable reduction in screen wear.

[0029] During operation, the silk-screening devices actuate a process for silk-screening flat objects, in particular ceramic tiles 2, in which the matrix of a silk-screen 3 made of a net material with perforations, is filled with glaze and then neared into a non-contacting facing position to the upper surface of the tile 2 to be glazed.

[0030] The loading of the perforations of the matrix with glaze by making the screen 3 pass contactingly between a doctor 4 and a low-friction contrast surface, and distributing the glaze on the doctor 4 which, in cooperation with the contrast surface opposing it, forces the glaze into the matrix perforations.

[0031] When at least one zone of the matrix, loaded with glaze, is arranged facing the tile 2, an air jet continuously strikes the glaze in that matrix zone. The jet is directed against the tiles 2, so that the glaze in drawn by the air jet and transferred on to the surface of the tile 2, while the screen 3 is kept at a brief distance (but without touching) from the surface. The air jet should preferably be concentrated in a restricted zone of the screen 3 and extended in a transversal direction to the advancement direction F of the screen itself and the tiles 2.

Claims

1. A process for realising silk-screen prints on objects, especially ceramic tiles (2), in which a silk-screening glaze is applied to an upper surface of the tiles (2) which are transiting along a conveyor line, by being caused to pass through perforations in a silk screen (3) arranged above said tiles (2) in transit, the silk screen (3) having at least a lower tract which is mobile in a substantially parallel direction to an advancement direction (F) of the tiles (2), the process being characterised in that it comprises the

following operations:

filling the perforations in the silk screen (3) with glaze in a zone of the silk screen (3) which is upstream of an advancement direction (G) of the silk screen (3) with respect to said mobile lower tract;
directing an air jet at the glaze loaded in the silk screen (3), said air jet being directed downwards so that the glaze is blown thereby and deposited on an underlying upper surface of a transiting tile; said lower mobile tract of the silk screen (3) being kept at a short distance from said transiting tile.

2. The process of claim 1, characterised in that filling the perforations in the silk screen (3) with glaze includes the following steps:

the silk screen (3) is made to pass contactingly between a doctor (4) and a rigid contrast element (5) made of a low-friction material;
the glaze is distributed on the doctor (4) which, in cooperation with the contrast element (5) surface, forces the glaze to occupy the perforations in the silk screen.

3. The process of claim 1 or 2, characterised in that the air jet is concentrated in one zone of the mobile lower tract of the silk screen (3), and that said air jet is narrow and elongate in a direction which is transversal to the advancement direction (G) of the silk screen (3) and to the advancement direction (F) of the tiles (2).

4. A device for silk-screening flat objects, in particular ceramic tiles (2), comprising a silk screen (3), predisposed above the tiles (2) which are transiting along a conveyor line, which silk screen (3) is provided with perforations through which a silk-screen glaze can be made to pass and be applied on an upper surface of the tiles (2); said silk screen (3) having at least a lower tract which is mobile in a substantially parallel direction to an advancement direction (F) of the tiles (2), characterised in that:

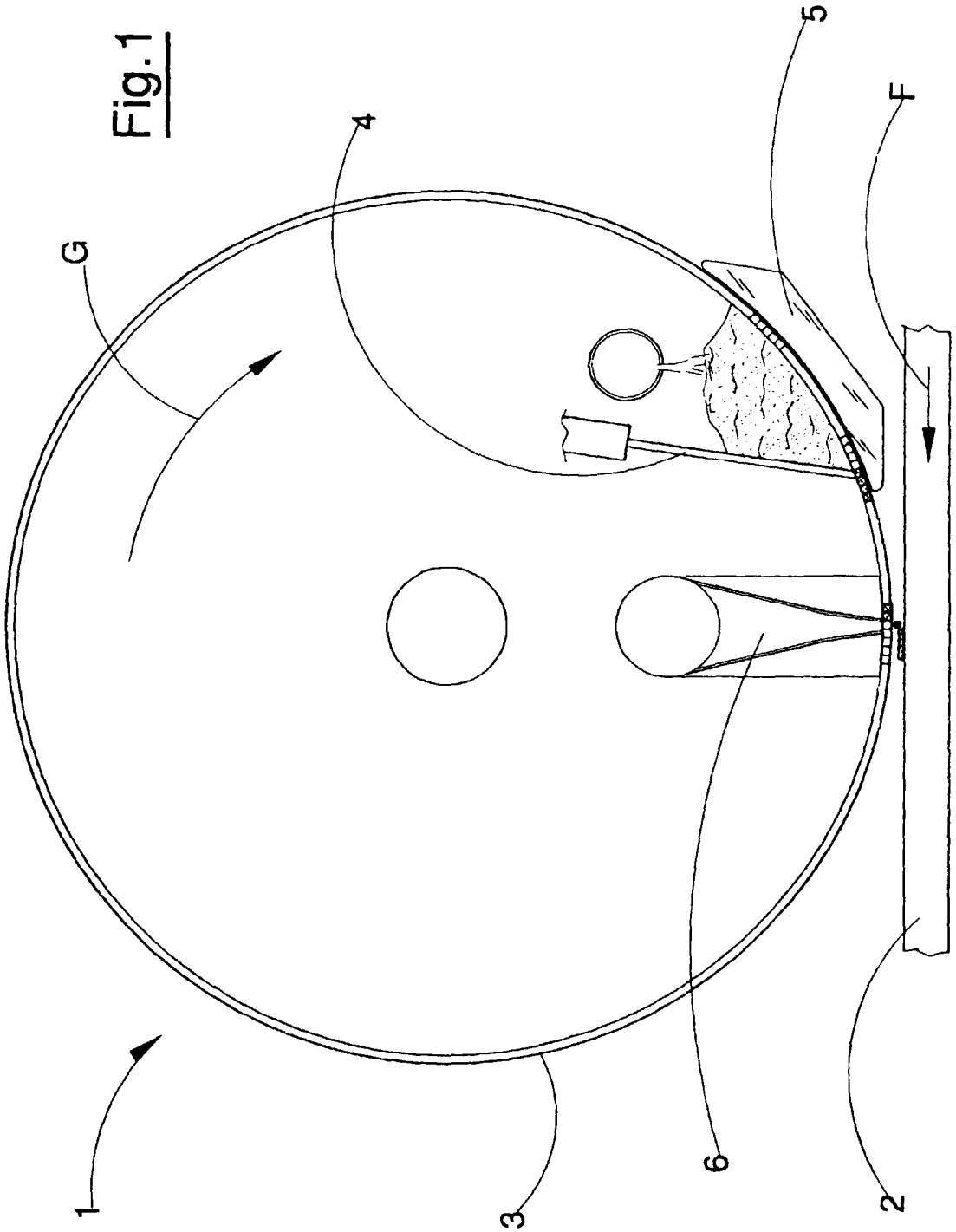
the lower mobile tract of the silk screen (3) is located at a short distance from the underlying upper surface of the tiles (2) transiting along the conveyor line;
means for loading the perforations with glaze are located in a zone of the silk screen (3) which is upstream of said lower tract with reference to an advancement direction (G) of the silk screen (3);
means for blowing are located above the mobile lower tract of the silk screen (3), and are predisposed to blow air towards the upper surfaces of the transiting tiles (2).

5. The device of claim 4, characterised in that the means for filling comprise at least a doctor (4) located in close counter-opposition to a rigid and low-friction contrast element (5), between which doctor (4) and contrast element (5) the silk screen (3) can pass, means of known type being predisposed to distribute the glaze on the doctor (4) which doctor (4) can cooperate with the contrast surface to force the glaze to occupy the perforations in the silk screen (3).

6. The device of claim 4 or 5, characterised in that: the silk screen (3) is fashioned into a tubular shape having a longitudinal axis which is arranged transversally of the advancement direction (F) of the tiles (2) along the conveyor line, and being able on command perform movements about said longitudinal axis thereof; the means for blowing (6) being conformed and arranged in such a way as to be able to concentrate the air jet on to a narrow and elongate zone of the lower mobile tract of the silk screen (3), parallel to the longitudinal axis of said silk screen (3).

7. The device of claim 6, characterised in that the silk screen (3) is ring-wound about wheels (7) and can be drawn in movement by the wheels (7).

Fig.1



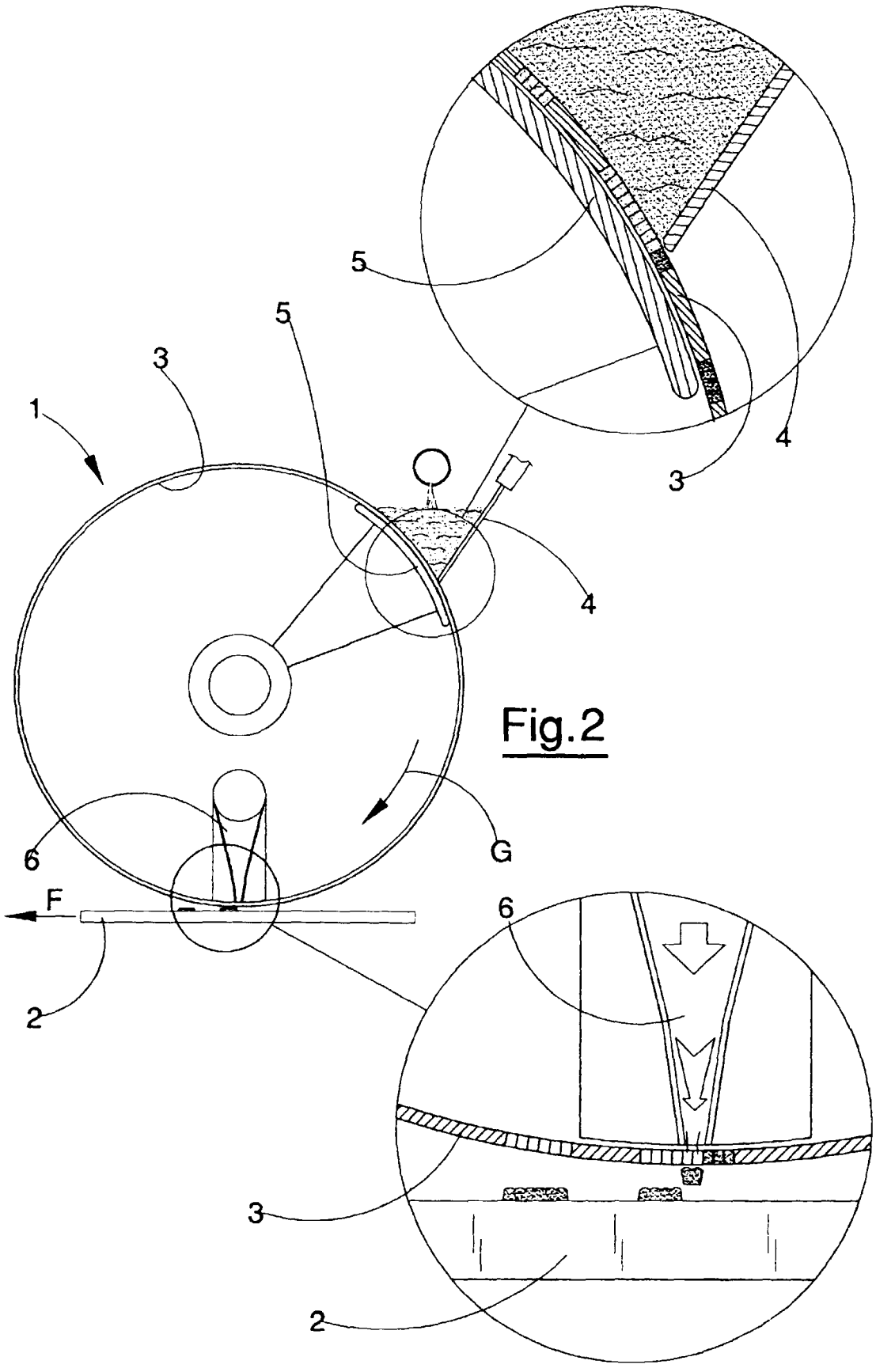


Fig.2

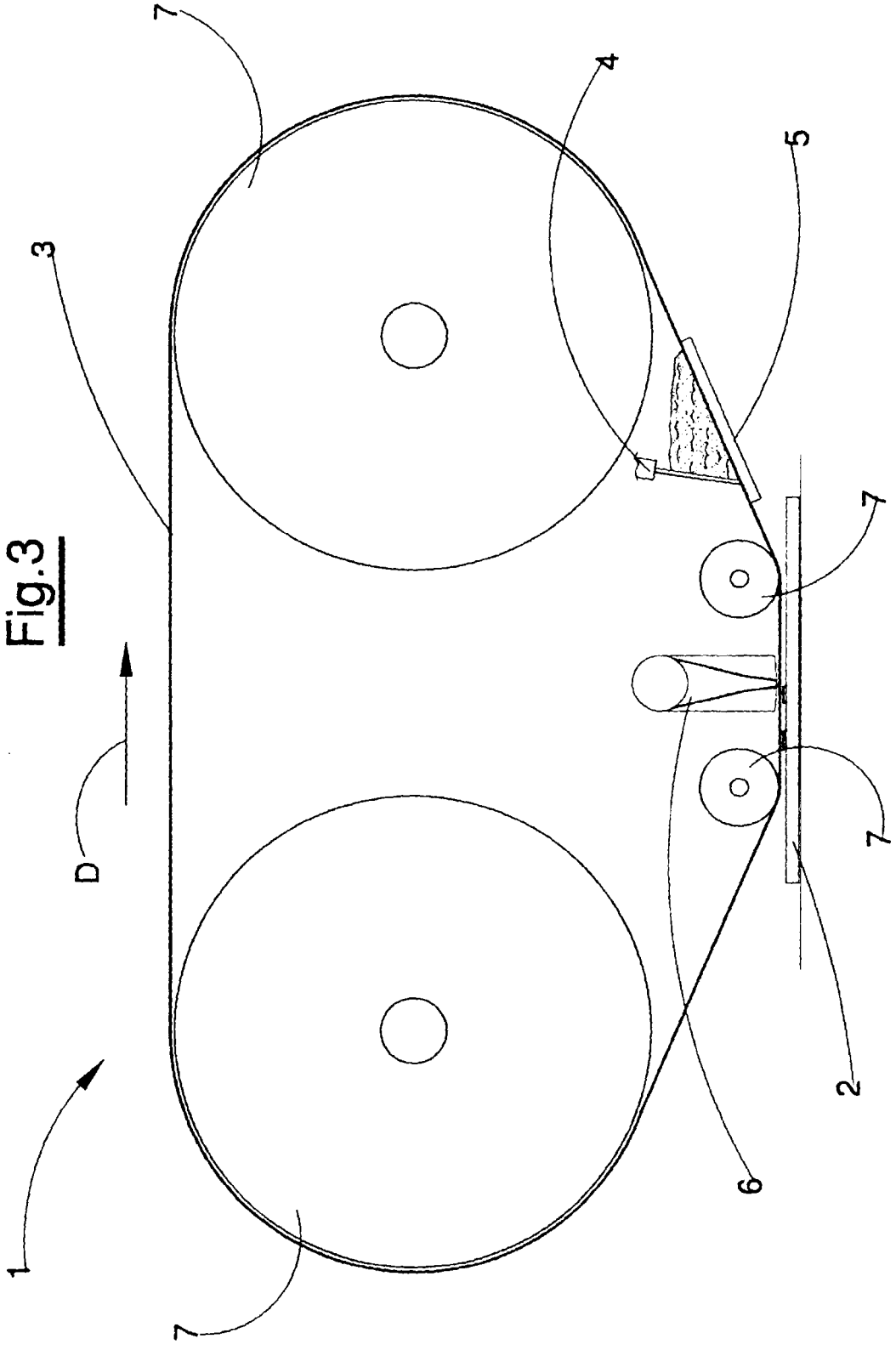


Fig.3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 83 0699

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	PATENT ABSTRACTS OF JAPAN vol. 011, no. 082 (M-571), 12 March 1987 & JP 61 238465 A (NEC CORP), 23 October 1986 * abstract *	1,4	B41F15/40
X	DE 42 28 177 A (WAKO WALZEN KONSTRUKTION SYSTE) 25 March 1993 * the whole document *	1,4	
X	DE 31 46 828 A (KLEINEWEFERS GMBH) 1 June 1983 * the whole document *	1,4	
X	DE 31 37 794 A (KLEINEWEFERS GMBH) 7 April 1983 * the whole document *	1,4	
A	WO 85 04621 A (ANDERSON) 24 October 1985		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B41F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	13 April 1999	DIAZ-MAROTO, V

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 98 83 0699

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

13-04-1999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 4228177 A	25-03-1993	DE 9111789 U	14-11-1991
		CH 685540 A	15-08-1995
		IT 1255503 B	09-11-1995
		JP 5301062 A	16-11-1993
		US 5316582 A	31-05-1994
DE 3146828 A	01-06-1983	DE 3137794 A	07-04-1983
DE 3137794 A	07-04-1983	DE 3146828 A	01-06-1983
WO 8504621 A	24-10-1985	US 4590854 A	27-05-1986
		US 4702165 A	27-10-1987
		AU 4217585 A	01-11-1985
		EP 0176571 A	09-04-1987

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82